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Annual Report of the 1991 Western Pacific Lobster Fishery

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Southwest Region
Pacific Area Office
National Marine Fisheries Service, NOAA
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Western Pacific Regional Fishery
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PREFACE

The fishery management plan (FMP) for the western Pacific crustacean fisheries was enacted by the Western Pacific Regional Fishery Management Council (WPRFMC) in 1983. Lobster permits are issued by the Regional Director, Southwest Region, National Marine Fisheries Service (SWR, NMFS). These permits allow lobster fishing operations in the Exclusive Economic Zones (from 3 to 200 nmi offshore) of American Samoa, Guam, Hawaii, the Commonwealth of the Northern Mariana Islands, and U.S. possessions in the western Pacific. The Fishery Monitoring and Economics Program (FMEP) of the Honolulu Laboratory, Southwest Fisheries Science Center, NMFS, NOAA, collects biological and economic information exclusively from vessels permitted to fish in the Northwestern Hawaiian Islands (NWHI). Only information on the NWHI fishery is presented in this report.

In addition to the FMEP staff, other NMFS staffs contributed to this report: The Insular Resources Investigation of the Honolulu Laboratory provided a summary of the biological research and assessment for the fishery, and Alvin Z. Katekaru of the SWR, Pacific Area Office, provided the administrative activities information. Information on WPRFMC-related activities was provided by Robert F. Harman.

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INTRODUCTION

The Northwestern Hawaiian Islands (NWHI) is an isolated range of islands, islets, banks, and reefs extending 1,500 nmi northwest of the main Hawaiian Islands (MHI), from Nihoa Island to Kure Atoll (Fig. 1). A commercial lobster fishery has operated in the NWHI for almost 15 years and primarily targets two species: spiny lobster, *Panulirus marginatus*, and common slipper lobster, *Scyllarides squammosus* (henceforth referred to as slipper lobster). A third species--ridgeback slipper lobster, *S. haanii*--is caught incidentally; a fourth species--Chinese slipper lobster, *Parribacus antarcticus*--is not commercially attractive.

This report details commercial lobster fishing activity in the U.S. Exclusive Economic Zone (EEZ; 3-200 nmi offshore) of the NWHI. Current catch, effort, and revenue statistics are based on Federal logbook data and revenue reports.

RECENT DEVELOPMENTS

There were several developments of note in the 1991 NWHI lobster fishery: The Western Pacific Regional Fishery Management Council (WPRFMC) instituted emergency closures because of declining lobster catches and diminished lobster size; more lobster vessels were active during the first quarter when catch rates are historically poor; and after the closure was implemented, some lobster vessels transferred to other fisheries to make ends meet. Two positive signs in 1991 were the increase in the number of sublegal lobsters at the most productive banks and the higher prices for frozen spiny lobster tails.

Lobster catches (the lowest since the crustacean fishery management plan (FMP) was implemented in 1983) continued to decline in the 1991 season, partly because of the closures, as did catch per unit effort (CPUE). Thus, the WPRFMC recommended consecutive 90-day emergency closures of the fishery which commenced on 8 May 1991; the fishery reopened on 11 November 1991. Industry support for this closure was substantial.

Although the first quarter of most years is usually not very productive because of weather and oceanographic conditions, nearly 72% of the trap-hauls in 1991 were made during January-March, partly because of the impending emergency closures. After the closures went into effect, owners and operators were forced to seek alternatives to lobster fishing. Some operators turned to the bottomfish or pelagic longline fishery, and a few vessels concentrated their efforts on lobster fishing in the MHI. While some boats left Hawaii to fish in the Pacific Northwest or elsewhere, others remained idle at the docks. Ex-vessel revenue fell to its lowest since 1983 because of the closures and poor catches.

Necker Island's sublegal spiny lobster population has been strong for several years, and the CPUE has remained at the 1990 level. Vessel operators indicated that they had to move to other areas because of the large numbers of sublegal lobster caught in the traps. Gardner Pinnacles had similar conditions because of the dramatic increase in sublegal lobster. In 1990, the sublegal CPUE was 0.35 with nearly 500,000 trap-hauls at Gardner Pinnacles, but rose to 0.82 with 150,000 trap-hauls in the shortened 1991 season. However, sublegal CPUE at Maro Reef remained bleak.

Another positive factor for the fishery in 1991 was the increase in the maximum price for frozen spiny lobster tails to a high of \$19.68/lb. However, catches for the first quarter of 1992 continued to gradually decline, and prices dropped to around \$15/lb, probably because of U.S. imports creating lower prices for Hawaiian lobster tails. Wholesale buyers are predicting prices will show a continuing downward trend in mid-to late 1992 as the world market shifts with the reemergence of the South African lobster supply. Overproduction from other markets, such as Australia and New Zealand, is predicted to have an even greater effect on Hawaiian lobster tail prices because of these lower-priced imports.

LANDINGS AND REVENUE

In 1991, the total landings of lobsters equaled 183,406 lb or 83 metric tons (t; wet weight), with an ex-vessel revenue of \$1.03 million (Table 1). The NWHI fleet landed 68 t of spiny lobster and 15 t of slipper lobster (Table 2), an 81% and 80% decrease in catches, respectively. Tables 1 and 2 contain updates of data from Clarke et al. (1988), Clarke (1989), and Landgraf et al. (1990). Estimated landings, ex-vessel prices, and ex-vessel revenue by product type (frozen tails, frozen whole, and live) are in Table 3. The long-term trend in annual landings is in Figure 2. Long-term revenue is in Figure 3.

FISHING EFFORT

Lobster vessels fished a total of 432 fishing days in 1991 (Table 4) compared to 1,468 in 1990 (Table 5). Fishing effort in 1991 was the lowest since 1983 (Fig. 4). Several lobster vessels ($N = 5$) entered other fisheries in 1991 (Table 6) because of the fishery closures.

Nine vessels landed lobster from 21 trips, a 36% reduction in vessels and a 53% decrease in trips over 1990. Of these nine vessels, three fished for lobster the first part of the year (before the closure), then left Hawaii to fish in other areas; one fished the first part of 1991, then longlined the rest of the year; one bottomfished for most of the year, except November

and December when the fishery reopened. Another vessel fished for lobster the first 4 months, bottomfished 2 months, and then fished for lobster 2 months. One vessel was inactive for most of the year except during 1 month in the first quarter and the last 2 months of the year when it participated in the lobster fishery. Another participated in the longline fishery the first half of the year but remained inactive until November and December when it returned to lobster fishing. One vessel fished for lobster the first 4 months, tied up for 3 months, longlined 2 months, and then returned to the lobster fishery.

The average number of trap-hauls per fishing day for 1991 was 687, a 15% decrease from the 1990 average of 810. Effort was concentrated on four banks--Nihoa, Gardner Pinnacles, Necker Island, and Maro Reef (Table 4)--and is reflected in the landings by area (Table 7). Percent composition of catches of spiny and slipper lobsters (by number) in 1990 to 1991 is in Figure 5.

CPUE

The CPUE continued the decline which began in 1989 (Fig. 6). The combined CPUE for legal lobster dropped to 0.56 in 1991 with 0.44 for legal spiny lobster and 0.12 for legal slipper lobster (Table 4). The CPUE for legal spiny and slipper lobsters decreased slightly 12% and 4%, respectively from 1990. However, the total CPUE for spiny lobster increased slightly in 1990 from 1.05 to 1.19 and, for slipper lobster, fell from 0.26 to 0.17. The lowest combined CPUE before 1990 (0.66) and 1991 (0.56) was in 1987 (0.92) (Fig. 6). Table 4 shows the CPUE by area for 1991, (some data are confidential and therefore not shown if less than three vessels fished in an area).

Overall, CPUE for the confidential areas (i.e., fishing areas that had few vessels, so data are combined) dropped. Necker Island had a legal spiny lobster CPUE of 0.54 in 1990 and was slightly higher than the other areas (0.48) in 1991. Gardner Pinnacles followed with a CPUE of 0.46, and Maro Reef was third with a 0.42 (Table 4). Legal slipper lobster CPUE was highest at Nihoa with a CPUE of 0.27. Slipper lobster appeared to be a bycatch in 1991, except at Nihoa.

VESSEL OPERATIONS

Sea days analysis of the NWHI lobster fleet in 1991 is reported only in unadjusted modes (Table 8). In previous annual reports, adjusted data for annualized trip activity were presented by incomplete or experimental trips being deleted and by partial-year participation of individual vessels being projected to a full year's activity. However, adjusted data were not included this year because of the fishery closures.

Based on unadjusted data, the number of fishing days per vessel in 1991 was lower than in 1990 for all classes. Operations from class I and I-S vessels participating in the fishery are not included in the vessel operations figures because fewer than three vessels in these classes fished.¹

ECONOMIC ASSESSMENT

No overall economic assessment of the NWHI lobster fishery was attempted in 1991 because of the closures. Per-vessel revenue and income estimates would be relatively meaningless without information on vessel activities in alternative fisheries. However, material prepared for the WPRFMC's decision on limited entry identified the economic costs of the closures and the potential benefits for future years based on projections from previous years' research. A more formal economic evaluation of the fishery will be conducted to evaluate the implications of the quota approach.

Prices in 1991 were strong (Fig. 7), with an average of \$16.43/lb for frozen spiny lobster tails (up 9% from 1990). The range of prices varied substantially in 1991, with high prices of more than \$19/lb and low prices around \$10.50/lb. This increased range frequently represents marketing variation because of low supply. Slipper lobster prices fell slightly to \$9.49/lb.

BIOLOGICAL ASSESSMENT

Analyses of commercial logbook and research data indicated that low recruitment of spiny lobster to Maro Reef continued in 1991. Fluctuations in spiny lobster at Maro Reef were correlated with sea level changes at Midway Island and French Frigate Shoals 4 years earlier, (Polovina and Mitchum, In press) indicating that spiny lobster recruitment to portions of the NWHI may be affected by perturbations in average mesoscale oceanographic conditions. Evidence of poor spiny lobster recruitment to a commercially unexploited area (Laysan Island) supports the hypothesis. Because of continued poor recruitment to Maro Reef, overexploitation of the NWHI spiny lobster stocks could occur. Therefore, the FMP was amended to create a limited entry fishery and to impose an annual catch quota, gear restrictions, and a closed season. A CPUE model was fit to commercial CPUE data to estimate mortality, recruitment, and catchability for the NWHI lobster stocks (Haight and Polovina 1992). These estimates were used in an iterative CPUE model to

¹Vessels are categorized into size, activity, and class in Clarke and Pooley (1988); classes I and I-S are the largest vessels.

derive a catch curve which would, on the average, result in an annual commercial CPUE of 1.0 lobster/trap-haul. The 1991 commercial catch and effort data were used with the model, based on biological parameters, to simulate lobster population response to the closed fishing season and to estimate a commercial CPUE for the first month of the 1992 fishing season. This value was used in the CPUE-based catch curve to calculate a preliminary estimate of 750,000 lobsters for the 1992 slipper and spiny lobster quota. A final quota will be released in August 1992.

RESEARCH

Biological Research

Over a 3-year period, the Honolulu Laboratory conducted systematic trawl surveys around the Hawaiian Archipelago, collecting lobster phyllosomes from the NOAA ship *Townsend Cromwell*. Waters surrounding Oahu, Necker Island, Maro Reef, Lisianski Island, and Midway Islands have been examined, 0-120 nmi north and south of each bank's 100-fm contour, to record the abundance and distribution of larvae. Sea-surface currents are presently being monitored through a series of satellite drifter buoys deployed from the *Townsend Cromwell* in the waters around Necker Island and Maro Reef. Seasonal changes in abundance and distribution of larvae will continue to be explored and monitored in 1992 (W. Haight, Honolulu Laboratory, pers. commun., March 1992).

ENDANGERED AND THREATENED SPECIES INTERACTIONS

Interactions with endangered and threatened species are summarized in Table 9 and are based on information received from the daily lobster catch reports. All observations appear to be incidental and nonthreatening. As with all logbook programs, however, the degree to which interactions are underreported is uncertain.

WPRFMC ACTIVITIES

The WPRFMC is the policymaking organization for the management of fisheries in the EEZ around American Samoa, Guam, Hawaii, the Commonwealth of the Northern Mariana Islands, and other U.S. possessions in the Pacific. The WPRFMC prepares and modifies FMPs for domestic and foreign fishing in the region, based on advice from scientific and industry advisors as well as input from the general public. Regulations are administered by the NMFS and are enforced jointly by agents of the NMFS and the U.S. Coast Guard. The FMP for crustaceans (primarily lobster)

was implemented in 1983 and has been amended six times (through 1991) as conditions in the fishery changed.

Amendment 6 (1991) defined recruitment overfishing for the NWHI lobster stocks, in accordance with the revised guidelines for National Standards 1 and 2 of the Magnuson Fishery Conservation and Management Act. A notice of the amendment's approval by the Secretary of Commerce was published in the Federal Register on 22 February 1991 (56 FR 3071).

In response to concerns raised by lobster fishermen and NMFS researchers that a recruitment failure had occurred at one or more fishing banks in the NWHI and that the NWHI lobster stocks were deteriorating in general, the WPRFMC developed recommendations for additional methods to manage the fishery. These recommendations, and an industry response to them, were presented to the WPRFMC at its February 1991 meeting. In addition, the WPRFMC sponsored a workshop in January 1991 on the transferability of fishing permits. Participants discussed various aspects of permit transferability and developed recommendations for the various WPRFMC fisheries. For the limited entry system proposed for the NWHI lobster fishery, the workshop participants suggested that permits be freely transferable. This advice concurred with that of the fishing industry, so the free permit transfers were approved as part of amendment 7 to the limited entry program.

The WPRFMC then recommended an emergency closure of the fishery, which became effective for 90 days on 8 May 1991 (56 FR 21961), and was extended for another 90 days on 13 August 1991 (56 FR 36012). The fishery reopened on 11 November 1991, but only a fraction of the vessels that fished earlier in the year participated in late 1991 and early 1992.

During the closure, WPRFMC and NMFS staff developed amendment 7 to the FMP, which would implement a system of limited entry (15 vessels) with freely transferable permits, a fleet-wide catch quota, gear restrictions and an annual closed season from 1 January through 30 June. Amendment 7 appeared in the Federal Register as a proposed rule on 16 December 1991 (56 FR 65209). The final rule implementing the amendment was published on 26 March 1992 (57 FR 10437); the fishery was closed on 10 April 1992, and the remaining regulations took effect on 27 April 1992.

In December 1991, at the request of several fishermen, the WPRFMC asked the Crustacean Plan Monitoring Team to reexamine several management alternatives that had been rejected by the Team in developing amendment 7. These alternatives included a fishery for male lobsters only, increasing the legal minimum size, opening Laysan Island to lobster fishing, rotating closed areas in the NWHI, fleet versus individual quotas, and separate quotas for slipper and spiny lobsters. The Team met in February

1992 and recommended that no additional regulations were presently warranted; the WPRFMC concurred at its March 1992 meeting.

ADMINISTRATIVE ACTIVITIES

The Pacific Area Office, NMFS, issued 26 permits for commercial lobster fishing in the WPRFMC's Western Pacific Region during 1991. Twenty-three permits were issued for area 1 (NWHI EEZ), and three permits for area 2 (MHI EEZ). No permit applications were received for area 3 (American Samoa and Guam). One permit was issued to a new entrant into the MHI fishery.

The total trap carrying capacity reported from the 9 active vessels in the fishery during 1991 was 8,750, a 43% reduction over the previous year. The average carrying capacity of active vessels for the same period was 972 traps.

Table 10 shows permit and vessel activity in the lobster fishery in the NWHI, 1983-91, as reported on the permit applications to the NMFS.

ENFORCEMENT ACTIVITIES AND VIOLATIONS

No enforcement activities were reported by the NMFS, Southwest Enforcement office.

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Table 1.--Annual landings (number and pounds), ex-vessel revenue (US\$), fishing effort (trap-hauls, vessels, and trips), catch per unit effort (CPUE; number of legal lobsters per trap-haul), and prices (US\$/lobster) of slipper and spiny lobsters combined from the Northwestern Hawaiian Islands, 1977-91. Data are from vessel logbooks and revenue reports.

Year	Landings		Revenue ^b (\$)	Trap-hauls (No.)	Vessels (No.)	Trips (No.)	Combined legal CPUE ^c	Price/lobster
	No.	Pounds ^a						
1977	--	72,000	209,000	--	5	14	--	--
1978	--	45,000	135,000	--	2	12	--	--
1979	--	100,000	320,000	--	2	6	--	--
1980	--	328,000	1,114,000	--	3	12	--	--
1981	--	780,000	2,730,000	--	10	25	--	--
1982	148,214	187,000	673,000	47,738 ^e	7	19	3.10	4.54
1983 ^d	234,700	203,000	591,000	84,870	4	19	2.77	2.52
1984	872,400	1,017,000	2,624,000	363,000	11	38	2.40	3.01
1985	1,812,700	2,368,000	5,887,000	983,062	16	62	1.80	3.21
1986	1,787,400	2,202,000	3,982,000	1,352,580	16	60	1.32	3.35
1987	737,800	969,000	3,988,000	804,723	11	38	0.92	5.41
1988	1,057,600	1,405,000	5,000,000	845,200	9	28	1.25	4.73
1989	1,160,250	1,470,000	6,291,000	1,071,538	11	33	1.08	5.42
1990	774,300	949,000	4,887,000	1,182,485	14	45	0.66	6.31
1991	166,700	183,000	1,028,000	296,648	9	21	0.56	6.16

^aIncludes the weight of frozen lobster tails expanded to represent whole weight (spiny lobster tail weight = 35.6% of whole weight; slipper lobster tail weight = 33.3% of whole weight).

^bRevenue is reported on a per trip basis. Some trips overlap years; revenue for those trips is prorated to each year.

^cLegal CPUE for slipper lobster before 1988 is calculated as 0.72 multiplied by the number of retained slipper lobster.

^dThe 1983 annual values were estimated from logbook returns from the latter 9 months of the year.

^eEstimate is from Clarke et al. (1988), Clarke (1989), and Landgraf et al. (1990).

Table 2.--Estimated landings, ex-vessel prices (US\$/lb), and ex-vessel revenue (US\$) of spiny and slipper lobsters landed from the Northwestern Hawaiian Islands, 1977-91. Data are from vessel logbooks and revenue reports.

Year	Spiny lobster				Slipper lobster			
	Pounds ^a	Metric tons	Price (\$/lb)	Revenue (\$)	Pounds ^b	Metric tons	Price (\$/lb)	Revenue (\$)
1977	72,000	33	2.90	209,000	--	--	--	--
1978	45,000	20	3.00	135,000	--	--	--	--
1979	100,000	45	3.20	320,000	--	--	--	--
1980	328,000	149	3.40	1,115,000	--	--	--	--
1981	780,000	354	3.50	2,730,000	--	--	--	--
1982	187,000	85	3.60	673,000	--	--	--	--
1983	203,000	92	2.91	591,000	--	--	--	--
1984	935,000	424	2.66	2,490,000	82,000	37	1.63	134,000
1985	1,438,000	652	2.94	4,227,000	930,000	423	1.78	1,660,000
1986	1,149,000	521	3.23	3,710,000	1,053,000	479	2.16	2,272,000
1987	530,000	241	4.67	2,479,000	439,000	200	3.44	1,509,000
1988	1,218,000	553	3.66	4,453,000	186,000	85	3.12	581,000
1989	1,266,000	574	4.44	5,624,000	203,000	93	3.28	667,000
1990	784,000	356	5.51	4,319,000	165,000	75	3.43	567,000
1991	150,000	68	6.06	911,000	33,000	15	3.54	117,000

^aIncludes frozen lobster tails expanded to represent whole weight (tail weight = 35.6% of whole weight).

^bIncludes frozen lobster tails expanded to represent whole weight (tail weight = 33.3% of whole weight).

Table 3.--Estimated landings, ex-vessel price (US\$/lb), and ex-vessel revenue (US\$), by product type, for spiny and slipper lobsters from the Northwestern Hawaiian Islands, 1977-91. Data are from vessel revenue reports; dash indicates the data are not available or are confidential and therefore are excluded.

Year	Product	Type	Spiny lobster			Slipper lobster			Revenue (\$)	Metric tons	Price (\$)	Revenue (\$)	Vessels (No.)	Trips (No.)
			Pounds	Metric tons	Price (\$)	Revenue (\$)	Pounds	Metric tons	Price (\$)					
1977	Live		72,000	33	2.90	208,000	--	--	--	--	--	--	5	14
1978	Live		45,000	20	3.00	135,000	--	--	--	--	--	--	2	12
1979	Live		100,000	45	3.20	320,000	--	--	--	--	--	--	2	6
1980	--		--	--	--	--	--	--	--	--	--	--	--	--
1981	--		--	--	--	--	--	--	--	--	--	--	--	--
1982	--		--	--	--	--	--	--	--	--	--	--	--	--
1983 ^a	Live		25,000	11	4.46	111,600	--	--	--	--	--	--	4	12
	Frozen	Whole	15	--	4.00	60	--	--	--	--	--	--	1	1
	Frozen	Tails	51,400	23	7.41	380,800	--	--	--	--	--	--	2	7
1984	Live		36,500	17	4.70	171,700	--	--	--	--	--	--	7	9
	Frozen	Whole	3,500	2	3.98	13,800	100	-- ^b	3.00	400	--	400	3	6
	Frozen	Tails	318,600	145	7.23	2,304,500	27,300	12	4.94	134,000	--	134,000	10	31
1985	Live		35,200	16	4.71	165,800	30	-- ^b	3.90	100	--	100	7	21
	Frozen	Whole	2,800	1	4.08	12,800	600	-- ^b	2.73	1,600	--	1,600	3	8
	Frozen	Tails	498,000	226	8.13	4,050,000	310,000	141	5.35	1,660,000	--	1,660,000	15	56
1986	Live		8,200	8	5.10	92,880	100	-- ^b	5.25	600	--	600	6	16
	Frozen	Whole	15,500	7	3.84	59,500	3,600	2	2.45	8,700	--	8,700	6	9
	Frozen	Tails	397,000	180	8.96	3,558,000	350,000	159	6.47	2,263,000	--	2,263,000	16	56

Table 3.--Continued.

Year	Product	Type	Spiny lobster				Slipper lobster				Vessels (No.)	Trips (No.)
			Pounds	Metric tons	Price (\$)	Revenue (\$)	Pounds	Metric tons	Price (\$)	Revenue (\$)		
1987	Live		12,400	6	6.50	80,900	5,500	3	7.29	40,400	3	9
	Frozen	Whole	800	-- ^b	5.78	4,600	1,800	1	3.96	7,100	3	3
	Frozen	Tails	183,200	83	13.00	2,383,000	143,000	65	10.16	1,452,000	10	37
1988 ^c	Live		6,000	3	7.51	44,900	4,400	2	7.64	34,100	4	8
	Frozen	Whole	1,400	-- ^b	4.00	5,500	--	--	--	--	3	3
	Live	Tails	431,000	196	10.24	4,402,200	60,500	28	9.04	547,000	9	28
1989	Live		24,000	11	7.62	188,300	14,500	7	7.03	102,000	4	9
	Frozen	Whole	2,200	1	5.00	11,100	--	--	--	--	--	--
	Frozen	Tails	441,300	200	12.29	5,424,600	62,900	29	8.98	565,000	11	33
1990	Live		57,900	26	7.27	421,300	6,000	3	6.66	41,000	6	16
	Frozen	Whole	500	-- ^b	8.00	4,000	--	--	--	--	--	--
	Frozen	Tail	258,300	117	15.07	3,894,000	53,200	24	9.94	526,800	14	43
1991	Live		5,900	3	8.02	47,400	2,500	1	7.63	19,200	4	11
	Frozen	Whole	350	-- ^b	10.49	3,700	--	--	--	--	--	--
	Frozen	Tail	51,300	23	16.77	859,900	10,000	5	9.61	97,900	9	11

^aApril through December 1983.^bLess than 1 metric ton landed.^cRevised from 1987 annual report.

Table 4.--Annual fishing effort (days fished and trap-hauls) and catch per unit effort (CPUE; number of lobster per trap-haul) for spiny and slipper lobsters in the Northwestern Hawaiian Islands, 1991. Data are from vessel logbooks.

Area	Days fished (No.)	Trap-hauls (No.)	Catch per unit effort					
			Spiny lobster			Slipper lobster		
			Legal	Sublegal	Berried	Total	Legal	Sublegal
Nihoa	52	17,450	0.21	0.01	0.05	0.26	0.27	0.00
Necker	179	109,422	0.48	0.63	0.04	1.15	0.07	0.00
Gardner Pinnacles	167	145,756	0.46	0.82	0.16	1.44	0.13	0.05
Maro Reef	28	19,320	0.42	0.11	0.04	0.57	0.16	0.05
Other ^a	6	4,700	0.15	0.07	0.02	0.24	0.07	0.01
Total	432	296,648	0.44	0.65	0.10	1.19	0.12	0.03

^aIncludes Brooks Bank, Raita Bank, Northampton Seamount, Pioneer Bank, Lisianski Island, Pearl and Hermes Reef, and French Frigate Shoals.

Table 5.--Annual fishing effort for active vessels in the lobster fishery in the Northwestern Hawaiian Islands, 1982-91. Number of vessels, trips, fishing days and trap-hauls. Fishing days per vessel are adjusted (see Table 8). Data are from vessel logbooks.

Year	Vessels	Trips	Fishing days	Fishing days per vessel	Trap- hauls
1982	7	19	--	--	47,738 ^a
1983	4	19	279	--	84,870
1984	11	38	822	--	363,000
1985	16	62	1,653	--	983,062
1986	16	80	2,166	--	1,352,580
1987	11	38	1,217	120	804,723
1988	9	28	1,617	139	845,200
1989	11	33	1,323	120	1,071,538
1990	14	45	1,468	109	1,182,485
1991	9	21	432	43 ^b	296,648

^aEstimated from Clarke and Yoshimoto (1990).

^bFishing days per vessel for 1991 are unadjusted because of the fishery closure.

Table 6.--Entry and exit patterns of individual lobster fishing vessels in the Northwestern Hawaiian Islands in 1991. Vessels are coded for purposes of confidentiality. X indicates vessels that fished for lobster in a particular month; B indicates vessels that bottomfished; virgules indicate vessels that were not fishing or were being refitted; L indicates vessels that longlined; and O indicates vessels that left Hawaii. Vessel codes with no entries indicate the vessels that fished in 1990 but not in 1991. Data are from vessel logbooks and shoreside monitoring.

Vessel code	Months											
	J	F	M	A	M	J	J	A	S	O	N	D
A												
B												
C												
D	X	X	X	X	/	L	L	L	L	L	L	L
E												
F	X	X	X	/	O	O	O	O	O	O	O	O
G	O	X	X	X	/	/	/	L	L	/	X	X
H												
I	L	L	L	/	/	/	/	/	/	/	X	X
J												
K	L	L	X	X	O	O	O	O	O	O	O	O
L	/	/	/	X	/	/	/	/	/	/	X	X
M	B	B	B	B	B	B	B	B	B	B	X	X
N	X	X	X	/	O	O	O	O	O	O	O	O
O	X	X	X	X	/	/	B	B	X	X	/	/

Table 7.--Annual fishing effort (vessel and trips) and catch (number) of spiny and slipper lobsters, by area, in the Northwestern Hawaiian Islands, 1991. Data are from vessel logbooks and revenue reports.

Area	Catch (No.)							
	Vessels (No.)		Trips (No.)		Spiny lobster		Slipper lobster	
					Legal	Sublegal Berried Total	Legal	Sublegal Berried Total
Necker Island	6		10		52,211	69,204	4,664	126,079
Gardner Pinnacles	4		6		66,819	120,216	22,776	209,811
Other ^a	4		11		12,539	2,512	1,631	16,682
Total	9		21		131,569	191,932	29,071	352,572
							7,506	364
							19,535	7,308
							8,185	988
							35,196	8,660
								100
								5,356
								32,199
								572
								9,635
								6,020
								49,804

^aIncludes Brooks Bank, Raita Bank, Northampton Seamount, Lisianski Island, Pioneer Bank, Pearl and Hermes Reef, Midway Islands, and Kure Atoll.

Table 8.--Number of vessels, trips, and sea days, by vessel class, for the lobster fleet in the Northwestern Hawaiian Islands, 1991. Unadjusted figures include incomplete trips; adjusted figures (which correct for vessels fishing less than full time and for incomplete trips) are not used in 1991 because of the fishery closure in the second half of the year. Standard deviations are in parentheses; dash indicates confidential data. Data are from vessel logbooks.

Vessels			Mean number of sea days by activity per vessel							
Class	No.	Trips (No.)	Sea days	Fishing	Traveling	Running	Weather	Breakdown	Rest/deck work	Missing
I, I-S	1	1	--	--	--	--	--	--	--	--
II	4	6	63.0 (18.6)	47.5 (18.6)	1.8 (2.1)	10.5 (3.7)	2.5 (3.7)	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)
III	4	12	55.0 (8.2)	40.0 (8.2)	0.0 (0.0)	12.5 (4.8)	1.0 (1.4)	0.8 (1.5)	0.3 (0.5)	1.3 (1.5)
Total fleet	9	21	58.2 (13.3)	43.2 (12.0)	0.9 (1.5)	11.2 (3.9)	1.8 (2.5)	0.4 (1.0)	0.3 (0.5)	0.7 (1.1)

Table 9.--Reported sightings of or interactions with endangered or threatened species by the lobster fleet in the Northwestern Hawaiian Islands, 1991. Data are from the vessel logbooks.

Area	No. of sightings by No. of animals	
	One animal	Two animals
Monk seals observed in statistical area		
Nihoa	8	8
Necker Island	2	0
Monk seals observed in vicinity of fishing gear		
	0	0
Turtles observed in statistical area		
Nihoa	1	0

Table 10.--Permit and vessel activity in the lobster fishery in the Northwestern Hawaiian Islands, 1983-91, as reported on the permit applications to the Southwest Region, Pacific Area Office, National Marine Fisheries Service.

Year	Permits issued (No.)	Active vessels (No.)	Trap carrying capacity (active vessels) ^a	
			Total	Average
1983	14	4	1,200	300
1984	19	11	5,240	476
1985	45	16	12,250	703
1986	54	16	13,580	849
1987	41	11	9,150	832
1988	26	9	9,420	1,047
1989	17	11	12,382	1,126
1990	22	14	15,380	1,099
1991 ^a	23	9	8,750	972

^aVessel names: Archer, Betty N, Bounty, Cornucopia, Haida, Laysan, Liberty, Lusty, and Miss Jessico.

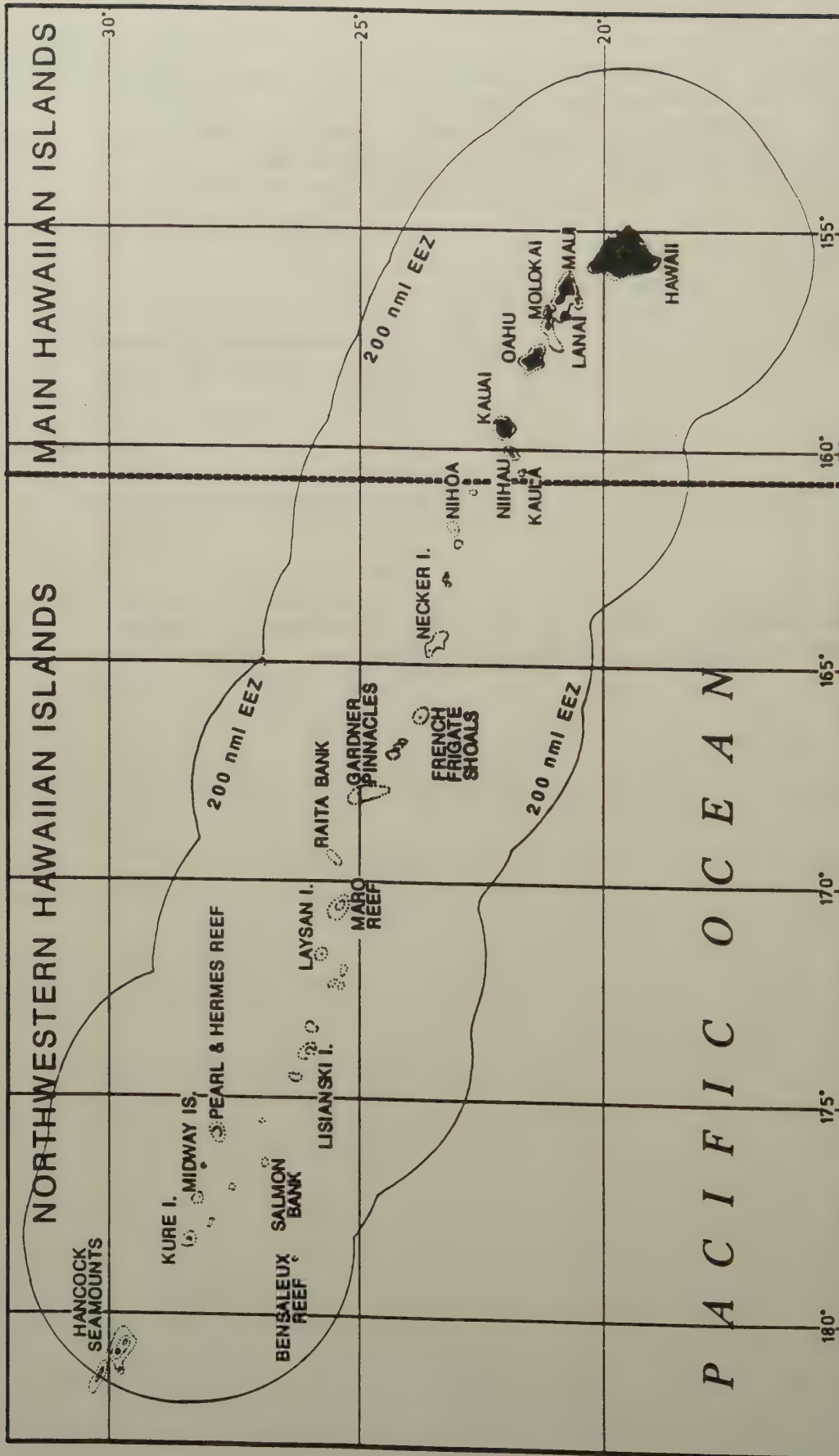


Figure 1.--Map of the Northwestern Hawaiian Islands (permit area 1), the main Hawaiian Islands (permit area 2) and the 200 nmi Exclusive Economic Zone (EEZ).

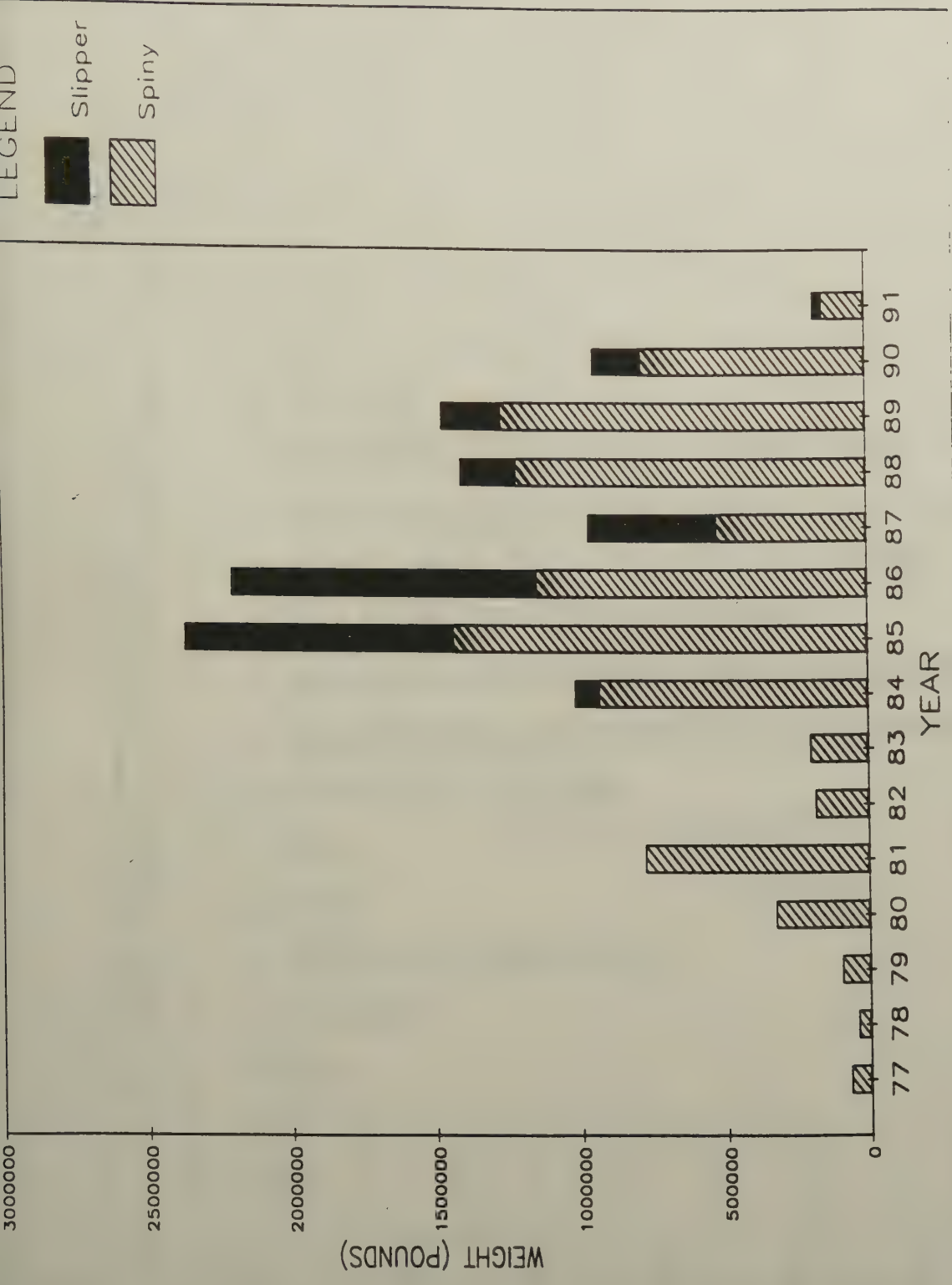


Figure 2.---Estimated annual landings (wet weight) of spiny and slipper lobsters in the Northwestern Hawaiian Islands, 1977-91.

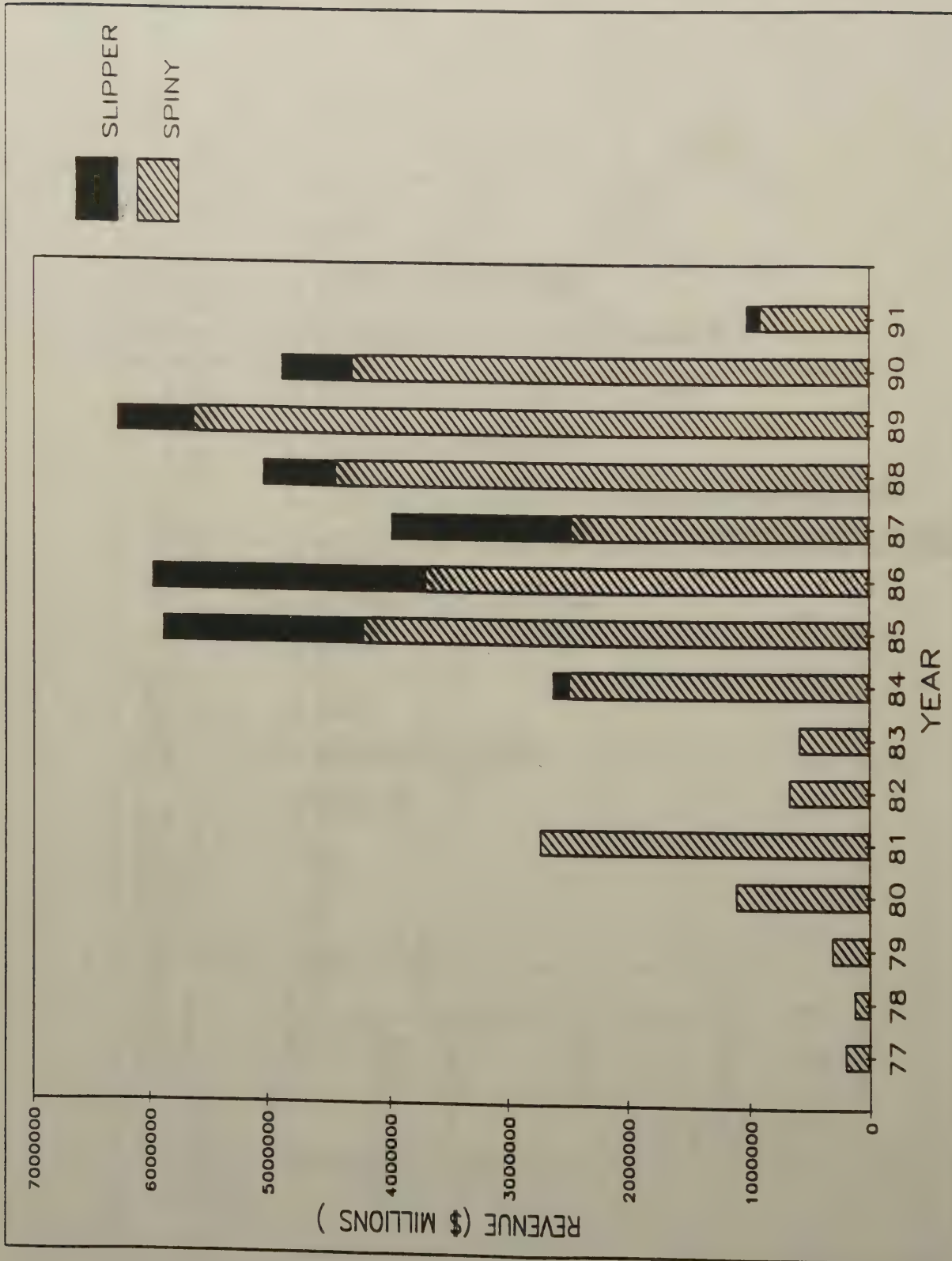


Figure 3.--Ex-vessel revenue for spiny and slipper lobsters from the Northwestern Hawaiian Islands, 1977-91.

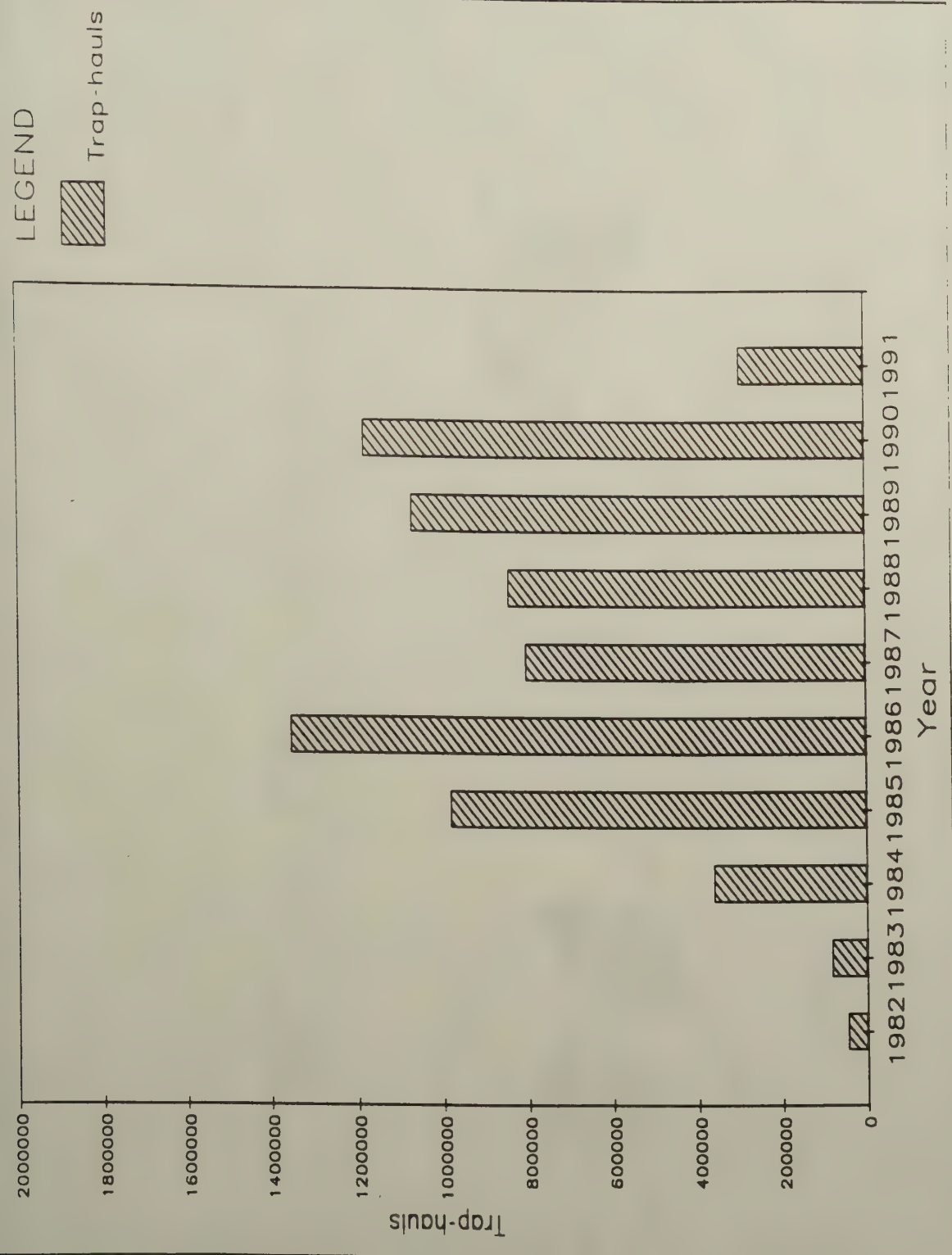


Figure 4.--Fishing effort (trap-hauls) by the lobster fleet in the Northwestern Hawaiian Islands, 1982-91.

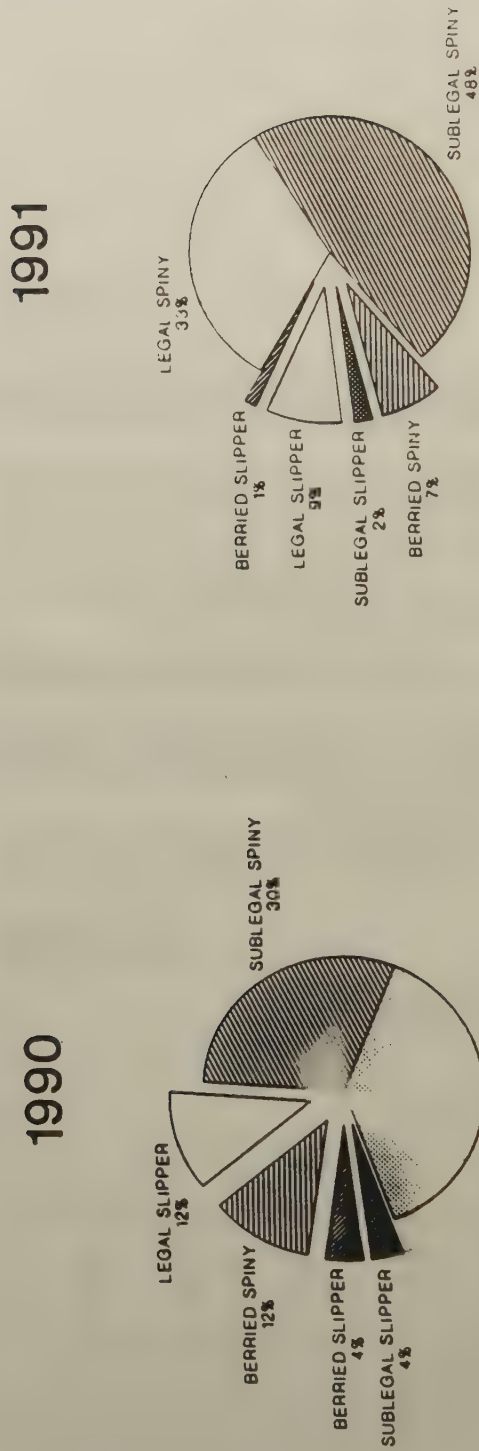
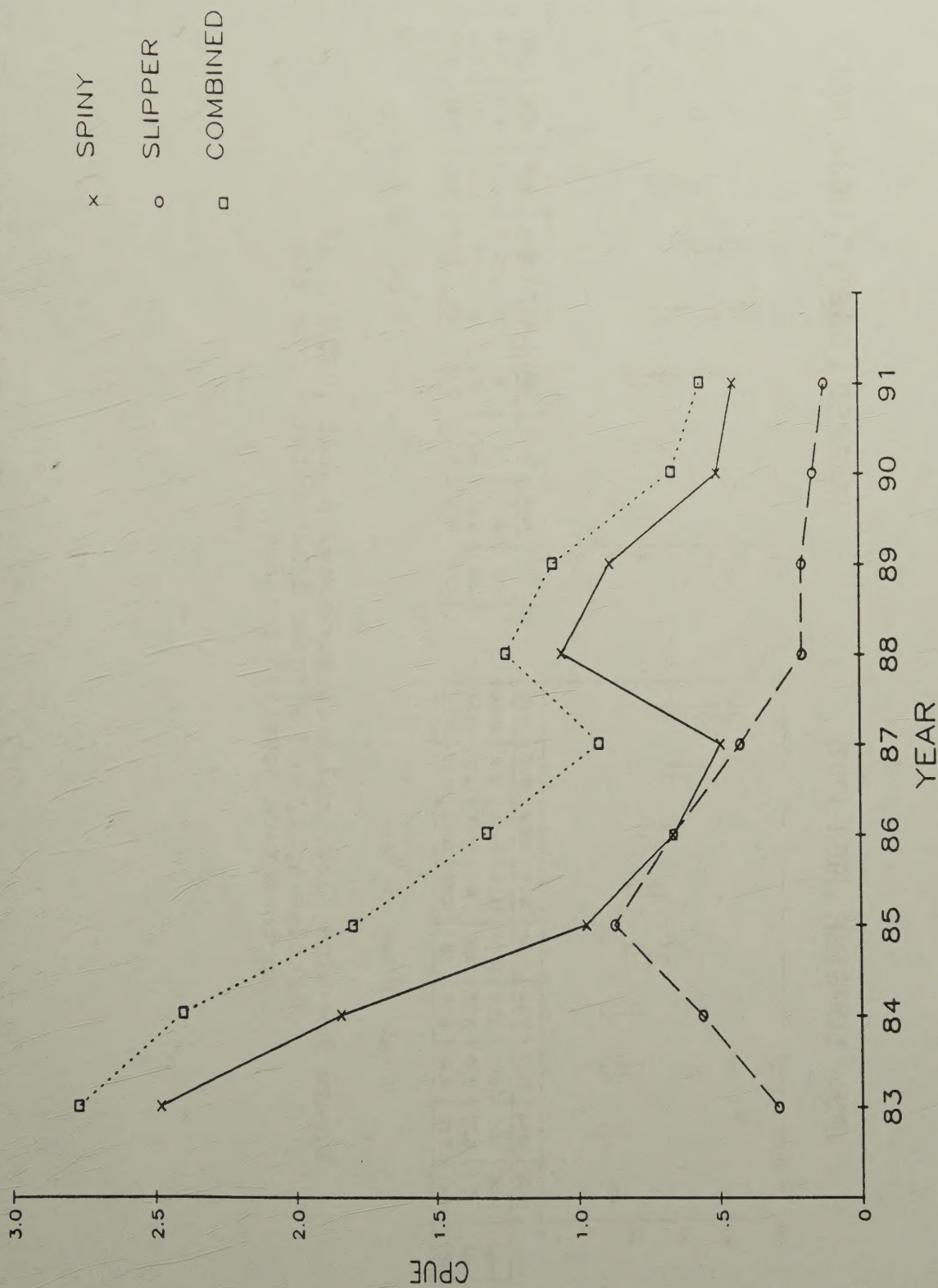


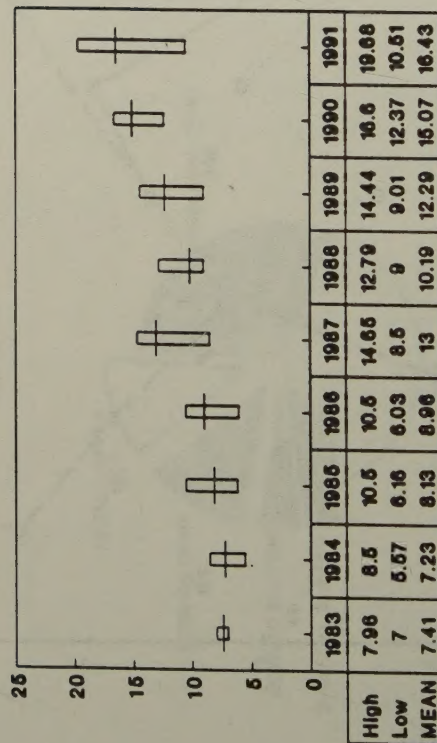
Figure 5.--Percent composition of catches of legal spiny and slipper lobsters (by number) from the Northwestern Hawaiian Islands 1990-91.



pre 1988 value for total slipper $\times 0.72$ equal legals for 1988 and 1989

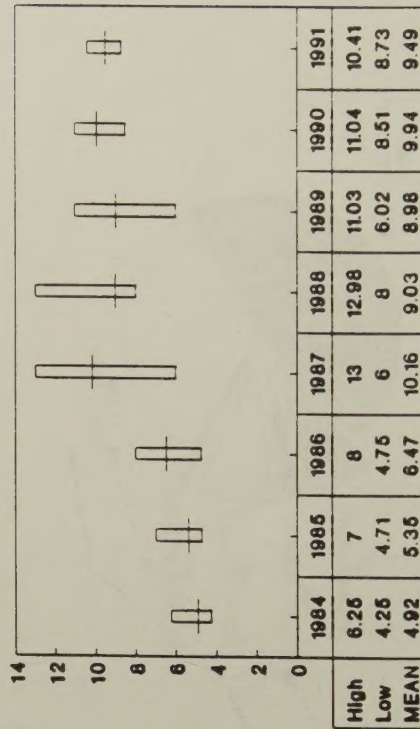
Figure 6.--Catch per unit effort (CPUE) for spiny and slipper lobsters from the Northwestern Hawaiian Islands, 1983-91. (CPUE for slipper lobster is calculated as 0.72 multiplied by the number retained before 1988.)

SPINY LOBSTER (1983-1991)



□ High □ Low ⊕ MEAN

SLIPPER LOBSTER (1984-1991)



□ High □ Low ⊕ MEAN

Figure 7.--High, low, and mean ex-vessel prices (US\$/lb) of frozen spiny and slipper lobster tails from the Northwestern Hawaiian Islands.

